

# ALASKA MIXED VEGETABLE PROFILE

## Cabbage, Carrots and Lettuce

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### PRODUCTION FACTS



Producing cabbage, carrots and lettuce in Alaska profitably requires considerable cropping experience, biological knowledge and exceptional managerial skills as sub-arctic environmental conditions can be limiting. Although there are numerous difficulties involved in high latitude vegetable production, the 100-day growing season is augmented by long daylength, which allows for high production under irrigated systems. Cabbage production of 20,500 cartons was harvested from 33 acres in 2003.

Average carton weight for Alaska grown cabbage was 48 pounds, yielding approximately 492 tons of product. Carrot production totaled 19,300 cwt from 75 acres in 2003, or 965 tons of product. Head Lettuce production of 15,000 cartons was harvested from 45 acres in 2003. Average carton weight for Alaska grown head lettuce was 45 pounds, yielding approximately 337.5 tons of product (Benz and Lucero, 2004).

	Cabbage	Carrots	Lettuce
Product Cost/Acre <sup>1</sup>	\$500-1500	\$1700-4800	\$1300-5000
% Alaska Fresh Market <sup>2</sup>	13.6%	36.7%	6.2%

Growing conditions are favorable for cabbage, carrots and lettuce production throughout the Interior and South Central Alaska. The primary commercial vegetable production area in Alaska is the Matanuska Valley (61 N 149 W), which supports a growing season from mid-May through September. Located on the Knik arm of Cook Inlet, the elevation is near sea level with a maritime climate. The winter snow is typically removed by strong winds in the early spring or melts in March and April. The average precipitation pattern usually includes light rain in May and June with increased amounts in July, August and September. Sunlight is a major factor in crop production in sub-arctic Alaska with near-continuous light prevailing from mid-May through mid-July, followed by long but decreasing photoperiods through the end of the growing season. Soil temperature peaks in early July at approximately 68°F.

<sup>1</sup> Product Cost/Acre: Alaska does not have complete cost analysis production data for cabbage, carrots or lettuce. Estimates of these costs were obtained from: Sample Cost to Establish and Produce Cabbage, Imperial County-2000 (Mayberry 2000); Sample Cost to Establish and Produce Carrots, Imperial County-2000 (Mayberry 2000); and Sample Cost to Establish and Produce Leaf Lettuce, Imperial County-2000 (Mayberry 2000). While not all inputs are the same between CA and AK, Alaskan production costs are estimated to be at the higher end of the cost ranges given.

<sup>2</sup> % Alaska Fresh Market: (2000 data - Benz, 2002).

Limited commercial vegetable production also takes place in the Tanana/Delta Junction area of Interior Alaska. Long-day photoperiods (20+ hours of daylight in June) and a frost-free growing season of 100-118 days in length characterize Interior Alaska's growing season, which is offset by low spring precipitation, warmer summer temperatures than South Central Alaska and colder winter temperatures.

### PRODUCTION REGIONS



The commercial production of cabbage, carrots and lettuce in Alaska provides a high quality product for the fresh table market. The Matanuska Valley (2) remains the breadbasket of Alaska and is the principal production area partly due to its proximity to Anchorage, Alaska's largest city with a population of approximately 270,000. A paved highway system of over 2,500 miles links Anchorage to other populated areas: the Kenai Peninsula (3) to the south, the Matanuska Valley (2) and Fairbanks (1) to the north, Delta Junction (1) to the northeast and the Copper River Basin and Valdez (2) to the east.

Alaskan growers rely upon this transportation corridor to access 450,000 of the state's 620,000 military and resident civilian population. Small-scale commercial vegetable production also exists on the Kenai Peninsula, Kodiak Island and Dillingham. The production from these areas reach local farmer's markets and in some cases local grocery stores where the freshness and profit of supporting locally grown produce is realized.

PRODUCTION AREAS	Cabbage <sup>3</sup>	Carrots	Lettuce
Mat-Su Valley	31 Acres (94%)	58 Acres (77%)	45 Acres (96%)
Interior (Delta/Fairbanks)	2 Acres (6%)	17 Acres (23%)	2 Acres (<.4%)

### CROPPING PRACTICES

**Soils & Fertility:** Cultivated soils in South Central Alaska are developed from loess deposited over alluvial sands and gravel. Other than the volcanic ash soils that fix large amounts of phosphorus (P), soils are fairly fertile. Phosphorus fertilizer recommendations are based on soil test results and tied to soil series that accounts for the P fixing of some soils. Nitrogen (N) application rates are based on soil analytical results and fertilizer guides. The potassium (K) supplying capacity of these predominately silt loam soils is fairly high and typical application rates are also based on soil test results. Natural pH levels of 5.5-6.0 are common with liming requirements generally based on SMP Buffer analysis.

Commercial producers utilize a complete fertilizer on the mixed vegetable crops. Commercial organic vegetable producers utilize a variety of natural fertilizers including Alaska fishmeal, Alaska sea kelp and a variety of manure resources.

<sup>3</sup> Cabbage, Carrots and Lettuce acreage (Benz, S. and G. Lucero, 2004.)

General cabbage and lettuce fertilizer rates of 60-150 pounds of nitrogen, 50-200 pounds of phosphorus and 60-180 pounds of potassium are applied per acre (Walworth, 1992). In addition, most of South Central Alaska's soils are sulfur deficient, requiring 50-70 pounds of sulfur per acre, often applied in a sulfate form.

Under Alaska's long days, rapidly growing lettuce plants are susceptible to "tip burn", where the margins of inner leaves die from a localized deficiency of calcium, when transport from the roots is inadequate. Rapid growth, short nights and little evaporation from the inner leaves all contribute to the lack of calcium transport. Selecting resistant cultivars is a good control measure for tipburn (Ryder and Waycott, 1998). Lettuce trials, conducted in Alaska since 1995, indicate that commercially available cultivars show differences in susceptibility to tipburn, with larger heading cultivars generally more susceptible than smaller heading cultivars (Walworth et. al., 1998; Walworth et. al., 1997, and Walworth et. al., 1992). The "whiptail" symptom in cabbage, the result of molybdenum deficiency, has also been reported and is corrected through appropriate soil amendments.

General carrot fertilizer rates of 75-100 pounds of nitrogen, 60-135 pounds of phosphorous and 60-180 pounds of potassium are applied per acre. In addition, 50-70 pounds of sulfate sulfur are applied per acre.

**Varieties:** Alaskan mixed vegetable producers utilize a multitude of varieties to meet both their personal and marketing needs. Varieties are often kept confidential, as competition between growers for the limited marketing opportunities is great. Nantes-type carrots are commonly grown for the fresh market, with Ingot and Prime Cut two examples of commercially grown varieties.

**Planting:** Planting and transplanting begins in mid-May with the day-length reaching nearly 17 hours and fallow soil temperature at 4 inches approaching 45<sup>0</sup> F. The probability of frost is very low at this time (Alaska's Agricultural Potential, 1974). First plantings are usually completed by the first week in June. Carrots are usually planted into beds, utilizing multiple rows or combinations of multiple rows (from 6-12 rows per bed). Seeding rates vary considerably, depending upon desired end product. Carrot seeding rates of 250,000 to one million per acre are common.

Three types of lettuce are commonly transplanted: leaf, head and romaine. Leaf lettuce is generally planted on a weekly basis for up to 12 weeks, while head and romaine lettuces are planted weekly for up to 10 weeks.



Both red and green cabbages are grown, with approximately 85% of the cabbage crop planted to green varieties. Direct seeding results in damping off problems of young seedlings for many growers. The transplanting of 2.5-3 inch tall cabbage plants is utilized to alleviate this seedling disease problem.

**Irrigation:** Irrigation, part of the farm management program, is performed as needed. The amount of seasonal distribution of rainfall is not sufficient to maximize production potential. Irrigation is accomplished primarily by wheel and hand-line sprinkler systems. Irrigation is scheduled using tensiometers and gypsum blocks in the Matanuska Valley.

### **IPM PRACTICES**

Most growers practice some form of integrated pest management. Crop rotations are practiced by 90% of the growers, with a potato, vegetable, fallow or grain rotation most common. Weekly insect pest population monitoring is sporadically conducted. Alaska is fortunate to be free from many of the insect pests and diseases common to the rest of North America.

**Insects:** The most prevalent insect pests of lettuce and cabbage crops are aphids and root maggots, respectively. Development of economically damaging population levels from either pest is seasonally and location dependent. Combating these pests require a variety of control methods. Time of planting has a direct effect on the incidence of pest damage, with earlier cabbage crops somewhat more susceptible to root maggot damage. Seventy-five percent of mixed vegetable growers utilize some chemical controls when needed, while all growers maximize the use of cultural and mechanical practices where applicable.

#### **Aphid Control**

##### **Lettuce**

<b>Insecticide</b>	<b>Users</b>	<b>Use</b>	<b>Product Rate/a</b>	<b>a.i. Rate/a</b>	<b>REI</b>	<b>PHI</b>
Orthene 75S <sup>4</sup>	20% growers	42% acres	0.67-1.33 lb	0.75-1 lb	24 hrs	21 days
Digon 400 <sup>5</sup>	15% growers	29% acres	8 oz	0.25 lb	48 hrs	7-14 days
Dimethoate 2.67EC <sup>6</sup>	15% growers	29% acres	12 oz	0.25 lb	48 hrs	7-14 days

##### **Cabbage**

<b>Insecticide</b>	<b>Users</b>	<b>Use</b>	<b>Product Rate/a</b>	<b>a.i. Rate/a</b>	<b>REI</b>	<b>PHI</b>
Digon 400	15% growers	26% acres	8-16 oz	0.25-0.50 lb	48 hrs	7 days
Dimethoate 2.67EC	15% growers	26% acres	12-24 oz	0.25-0.50 lb	48 hrs	3 days

#### **Root Maggot Control**

##### **Cabbage**

<b>Insecticide</b>	<b>Users</b>	<b>Use</b>	<b>Product Rate/a</b>	<b>a.i. Rate/a</b>	<b>REI</b>	<b>PHI</b>
Lorsban 15G	15% growers	43% acres	4.6-9.2 oz/ 1000 ft. row	0.23-0.46 oz/ 1000 ft. row	24 hrs	none

Less prevalent cabbage and lettuce insect pests are managed mechanically, culturally or left to natural control. An example is irrigating for cutworm control in direct seeded lettuce. Unidentified late season pests have been observed but left uncontrolled to date. No economically

<sup>4</sup> Orthene 75S: Do not apply more than 2 2/3 lb/A (2lb a.i.) per season

<sup>5</sup> Digon 400: Lettuce PHI 7 days-head lettuce; PHI 14 days-leaf lettuce

<sup>6</sup> Dimethoate 2.67EC: Lettuce PHI 7 days-head lettuce; PHI 14 days-leaf lettuce

destructive insect problems have been reported on carrots to date. Grasshopper outbreaks have become more prevalent in recent years, which may force future chemical control measures.

**Disease:** While *Sclerotinia minor* has not been a problem in Alaska to date, a plant disease found in this cool growing climate common to all three “mixed vegetable” crops, is *Sclerotinia sclerotiorum*. Ronilan and Rovral are the products of choice for most growers using chemical alternatives in lettuce, although the use of Botran is increasing. Carrot and cabbage growers have not used chemical control for *Sclerotinia sclerotiorum* on a regular basis. Secondary watery soft rot infections have been reported in "tipburn" lettuce and to a lesser degree in cabbage, but no control has been attempted. *Botrytis* has also been reported in lettuce, especially when crop rotations are underutilized. Enhanced crop rotations and resistant varieties are the control methods of choice. Shothole (anthracnose) in lettuce and Cavity Spot in carrots have also been observed, but uncontrolled to date. Wirestem, a *Rhizoctonia spp.* that invades and damages cabbage plant stem tissue, often killing the plant, is enhanced when seedlings are wind-whipped.

The group of *Rhizoctonia spp.* that cause wirestem is not the same as the group that affects potatoes, so rotation with potatoes is a viable option. Support of the seedlings through mechanical hilling, prior to wind events, has offered some disease control.

### ***Sclerotinia sclerotiorum* Control**

#### **Lettuce**

<b>Fungicide</b>	<b>Users</b>	<b>Use</b>	<b>Product Rate/a</b>	<b>a.i. Rate/a</b>	<b>REI</b>	<b>PHI</b>
Ronilan EG <sup>7</sup>	20% growers	25% acres	1-2 lb	0.5-1 lb /a /application	12 hrs	28 days
Rovral <sup>8</sup>	40% growers	50% acres	1.5-2 lb	0.75-1 lb /a /application	24 hrs	14 days
Botran 75W <sup>9</sup>	20% growers	25% acres	2-5.33 lb	1.5-4 lb /a /application	12 hrs	14 days

**Weeds:** Mechanical cultivation as well as hand weeding is used to control weeds that thrive in the long days of summer. Weeding crews of 20-25 people, a mixture of college students, Russian families, housewives and locals add a major expense to crop production. These laborers are also used for transplanting, irrigation pipe moving and harvesting. Some organic producers use propane burners to deter weed infestation with expensive, but excellent results. The most common chemical used for weed control is glyphosate (Round-up), especially with the recent loss of Pronamide (Kerb), particularly where the rotation is solely potatoes and lettuce. Linuron (Lorox) is the only post-emergence herbicide used in carrots. A special state restricted conditional use permit of DCPA (Dacthal) has been issued for weed control in cabbage. Organic carrot production has increased, as Alaska’s largest carrot grower converted to 100% organic.

<sup>7</sup> Ronilan EG: No more than 3 applications (3 lb. a.i.) per season; Do not tank mix with Rovral, per label instructions.

<sup>8</sup> Rovral, no more than 3 applications per season

<sup>9</sup> Botran 75W, no more than 5.33 lbs. per acre, per season

Seven hundred and six bins of non-organic carrots and 144 bins of organic carrots were harvested in 2000, with no significant difference in yields. This conversion will reduce Alaska's over all reliance on carrot herbicides.

### Herbicides<sup>10</sup>

#### **Carrots**

<b>Herbicides</b>	<b>Users</b>	<b>Use</b>	<b>Product Rate/a<sup>11</sup></b>	<b>a.i. Rate/a</b>	<b>REI</b>	<b>PHI</b>
Lorox DF <sup>12</sup>	50% growers	35% acres	1.5-3 lbs	0.75-1.5 lbs	24 hrs	14 days
Roundup <sup>13</sup>	90% growers	60% acres	1-5 qts	1-5 lbs	12 hrs	14 days

#### **Cabbage**

<b>Herbicides</b>	<b>Users</b>	<b>Use</b>	<b>Product Rate/a<sup>14</sup></b>	<b>a.i. Rate/a</b>	<b>REI</b>	<b>PHI</b>
Vapam HL	35% growers	40% acres	37.5-75 gal	159.75-319.5 lbs	48 hrs	none
Dacthal W75	35% growers	40% acres	6-14 lbs	4.5-10.5 lbs	12 hrs	none

### **HARVEST**



With successive plantings and the variety of crops grown, harvest time continues throughout the summer. Cabbage and lettuce is hand harvested as it matures and packed directly into boxes, palletized and moved to coolers to be pulled for orders. Early morning loading and shipment to local markets is performed to meet fresh market demands. Freshness of "Alaska Grown" produce is an essential key to the marketing success of local producers statewide.

Carrots are primarily hand harvested, with only one or two growers utilizing mechanical diggers. They are then washed, bagged to order, bunched or processed for the baby carrot market. An estimated 1000 hours are required for hand weeding and harvesting per acre. Growers that supply the baby carrot market use a 2 inch cut, peel, bag and date code their products to meet the increasing local demand. All growers process their own fresh market products and oversee delivery to retailers/wholesalers. With an active market the demand for such locally grown produce can easily increase as consumers become more educated about the quality of locally produced products.

<sup>10</sup> Herbicides: Stand alone rates. Rates may differ when mixing multiple herbicides. Always consult label before use of any pesticide. Soil texture will determine application rates in many instances.

<sup>11</sup> Product Rate/a: Post-emergence of weeds only

<sup>12</sup> Lorox DF: Do not exceed 3 lbs. Lorox DF per acre, per season

<sup>13</sup> Roundup: Must not exceed 8 qts. of product/acre/year

<sup>14</sup> Pre-plant only



## STORAGE

Cabbage not immediately sold is stored at 32°F and 90%-95% relative humidity, for distribution through October. Carrots are stored at 30°F-32°F and 90%-95% relative humidity, for distribution through April of the following year. Lettuce is produced for fresh market only.

## MARKETING



The Alaska Division of Agriculture's *Alaska Grown* program has given the local growers a trademark in which to showcase their products. Each producer markets their own produce to grocery stores, military buyers, value added companies, farmer's markets,



and local produce stands. No grower cooperatives currently exist for product distribution.

## CROP ACTIVITY CHART

### Cabbage

Month	Activity
May	Fertilizing, ground prep., pre-emergence herbicide application, transplanting
June	Planting, irrigation (if required), insecticide applications, plant growth, weeding
July	Irrigation (if required), insecticide applications, plant growth, harvesting, weeding
August	Harvesting, weeding, marketing
September	Harvesting, marketing
October	Storage, marketing

### Carrots

Month	Activity
May	Fertilizing, ground prep., seeding, weed control
June	Seeding, irrigation (as required), post emergence herbicide applications
July	Plant growth, irrigation (as required), post emergence herbicide applications, weeding
August	Harvesting, weeding, marketing
September	Harvesting, storage, marketing
October	Storage, marketing

### Lettuce

Month	Activity
May	Fertilizing, ground prep., pre-emergence herbicide application, transplanting, weeding
June	Weekly transplanting, irrigation (if required), plant growth, insecticide applications, weeding, marketing
July	Weekly transplanting, irrigation (if required), plant growth, insecticide applications, fungicide applications (as needed), weeding, harvesting, marketing
August	Weekly transplanting, irrigation (if required), plant growth, herbicide applications, insecticide applications, fungicide applications (as needed), harvesting, marketing
September	Harvesting, marketing

## SUMMARY

While it is clear that crop production in this sub-arctic climate has certain limitations, it is also clear that growing produce adapted to this region is not only economically feasible but an important segment of agriculture in Alaska. There remains room for growth in this industry, especially in those areas of the state where producers are not currently growing these mixed vegetables on a commercial scale.

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